journals is to be continued. We trust its comprehensiveness, thoroughly scientific character, and general high standing will be maintained, and that it will continue a permanent monument to the genius, knowledge, and zeal of its founder.

THE NORWEGIAN NORTH ATLANTIC EXPEDITION

THE *Vöringen* left Hammerfest on July 29 on its last cruise. On the 31st, at noon, Bear Island was reached. Here the expedition was kept till August 3, the weather being too stormy to allow sea work to be done. In the night of August 1–2 a party landed on the east side of the island, where the sea was sufficiently smooth to allow a boat to land: but foggy weather interfered with any observations of importance being made. Some birds were shot and some fossils collected. In the morning hours extensive fishing operations were carried on from the deck of the ship, now anchored in some 12 fathoms. From 4 to 7 A.M. 200 large cods were hauled. From a point about midway between Bear Island and Spitzbergen we worked first up a cross section towards west-north-west, till we found 1,149 fathoms' depth on the afternoon of the 4th. From this point the course was shaped for South Cape, Spitzbergen. At noon on the 5th we made the cape, sailed round the island lying off the cape, and entered the Stor-Fjord. Here the sun was shining and the water smooth, so Capt. Wille swung the ship for deviation. The next morning we dredged on the bank lying south-east of South Cape; here the temperature was − 1°·2 C. at the bottom, in 140 fathoms, and zero in 120 fathoms. In the upper layers the temperature was very irregularly distributed, both increasing and decreasing with depth. We went again round the islands and to the west side of South Cape, taking here a departure for a larger cross section along the parallel of the cape towards Greenland. Having crossed the Spitzbergen bank, we sounded 523, 743, 1,017, 1,429, 1,487, and 1,686 fathoms, when we at last, on August 8, were stopped by the ice in 76° 26′ N. lat. and 0° 29′ W. long. Off the Spitzbergen bank we found 0° C. in a depth of 470 fathoms. The polar current was reached in long. 5° E. Station No. 360, where we met the ice, gave the following serial temperatures characteristic of the polar current:—Surface, 3°·2 C., 40 fathoms, − 1°·3; 70 fathoms, − 0°·3; 200 fathoms, − 0°·7; 300 fathoms, − 1°·0; 1,686 fathoms at bottom, − 1°·3. On this station we lost a trawl and 2,163 fathoms of dredge rope. The sea-bottom between Spitzbergen and Greenland was very rough; the trawl or dredge seldom came up without damage or having stones inclosed, some of which were rather heavy. We sailed, on August 9, northwards along the ice, and reached our next cross section on the 10th, lat. 77° 50′, long. 0° 9′ W. The soundings were, from west to east, 1,640, 1,686, 1,333, 1,343, 948, 110 fathoms. The polar current closed in about 4° E. long. Farther east, 0° C. was found in 300 to almost 500 fathoms. On Station No. 354, lat. 78° 1′, long. 6° 54′ E., we had the great satisfaction of verifying the Swedish sounding made in 1868 at the same place by von Otter in the *Sofia*. The Swedes found 1,350 fathoms, we found 1,343. This agreement gives me great confidence in von Otter's soundings, which were made with less perfect means than ours. The Swedish deep-sea soundings in the *Sofia* extend far westwards and northwards from Spitzbergen, and are therefore of the greatest importance. From our last cross-section we took a longitudinal section parallel to the coast of Spitzbergen. The depths reached were 421 fathoms (temperature 0°·0), 905 fathoms, and 459 fathoms in lat. 79° 59′, long. 5° 40′ E. There was 0° in 390 fathoms depth. There was ice floating in the surface temperature at 5°·2. This brought our section to a close.

It appears that here on the 80th parallel, the warm Atlantic current is still running northwards, backed up on the west coast of Spitzbergen. The polar ice, driven by northerly winds, is swimming on its back, and melted gradually off just like the end of the glaciers in the summer heat of the valleys. It was apparent that the current was rather strong towards the north, the ship's place being always, by observations and bearings, found more northerly than by dead reckoning. On the open sea it was found very difficult, not to say impossible, to determine the ship's place with the ordinary accuracy. The horizon was generally—as we observed when off the shore—lifted by a sort of mirage.

On August 15 we dropped our anchor at the Norway Islands, North Spitzbergen, where we took in some ballast. In the sound, where we were lying, the beach was formed of mere loose stones, granite, apparently burst asunder by frost. Flakes and small bergs of ice sailed through the sound with the tide and were often touching the shore, but I could not observe there any sign of the ice cutting any line or mark along the beach. From the Norway Islands we went out off Hackluyt Head, where we took a sounding, passed the Smeerenberg and the South Gat, and anchored in Magdalena Bay. The Admiralty chart of the last-named places, surveyed in 1818 by Franklin and Beechy, proved very accurate. In Magdalena Bay we found a bottom temperature of − 1°·7 to − 2°·0, in exact agreement with the results formed by M. Charles Martins in 1839 in the *La Recherche* expedition. Our last visit was in the Advent Bay ice-fjord, where Capt. Wille constructed a chart of the bay, assisted by Capt. Grieg and myself, who measured the base line, some trigonometrical angles, and took altitudes for latitude and longitude. Foggy weather prevented our visit to Bell Sound. On August 23 we left Spitzbergen, and on the 26th we anchored at Tromsö. On September 4 the *Vöringen* returned to Bergen and the expedition was closed. The three summers have yielded in all 375 sounding-stations, 113 temperature series, 44 dredgings, and 42 trawlings.

H. MOHN

THE ANCIENT CAPITAL OF ITHACA

IN a recent letter to the *Times* Dr. Schliemann describes his search for the ancient capital of the island of Ithaca. He began his researches in the valley called Polis, which is in the northern part of the island, and has generally been considered as the site of the Homeric capital of Ithaca—first, on account of its name, which is the Greek word for city; second, on account of its splendid harbour, at a distance of only two miles from a small island now called Mathitarió, which, being the only one in the strait between Ithaca and Cephalonia, has naturally always been identified with the Homeric island of Asteris, behind which the suitors of Penelope were in wait for Telemachus on his return from Pylos and Sparta ("Odyssey," iv., 844-847). As a fourth reason for the identity of Polis with the site of Ithaca's capital, he mentions an acropolis which one thinks to perceive on the very steep rock, at a height of about 400 feet, on the north side of the port. Dr. Schliemann found it to consist of a very irregular calcareous rock, which had evidently never been touched by the hands of man, and can most certainly never have served as a work of defence. There can be no doubt that the name of this valley is derived not, as has been hitherto thought, from a real city, but merely from an imaginary fortress.

Besides, this valley is the most fertile spot in Ithaca, and it can therefore never have been used for the site of a city; in fact, it never yet occurred in Greece that a city should have been built on fertile land, and least of all can such have been the case on the rocky island of Ithaca, where arable land is so exceedingly rare and precious.

The island Mathitarió Dr. Schliemann visited and carefully measured. Its length is 586 feet; its breadth varies between 108 feet and 176 feet. It cannot, on account of these small dimensions, possibly be identified with the Homeric Asteris, which, as the poet says, had two ports, each of them with two entrances.

Though for all these reasons Dr. Schliemann was perfectly convinced that no city can ever have occupied the fertile valley of Polis, yet he thought it in the interest of science to investigate the matter by actual excavations. He sunk there many shafts, but in nearly all of them he struck the natural rock in a depth of 10 to 13 feet, except in the middle of the valley, which seems to have been hollowed out to a great depth by a mountain torrent. Fragments of rudely-made black or white Greek pottery and pieces of tiles were all he found. There were only a few fragments of archaic pottery for which he could claim the sixth century B.C. Tombs are sometimes found on the neighbouring heights, but, as is proved by the pottery and coins contained in them, they are of the third, fourth, or fifth century B.C. Of the same period are also the antiquities found in a cavern to the right of the port of Polis; for an inscription found there Dr. Schliemann can with certainty claim the sixth or even the seventh century B.C. Therefore, the supposition that Polis is the site of the Homeric capital of Ithaca must now be definitely abandoned.

Dr. Schliemann afterwards carefully surveyed the remaining northern part of the island, but found nowhere the site of an ancient town, except in the environs of the small building of cyclopean masonry, usually called "School of Homer," which the owner of the property has lately converted into a small church. He refused Dr. Schliemann permission to excavate in the church, but allowed him to do so in the adjoining fields, where a number of rock-cut house foundations and remnants of cyclopean walls testified to the existence of an ancient settlement. He dug there a great many holes, but always struck the natural rock in less than 3 feet, and sometimes even in a depth of less than 12 inches; thus there can be no doubt that a town has existed here in classical times, and most probably it is the very town mentioned by Scylax Per. 34, and Ptolemæus III., 14, 13.

Dr. Schliemann proceeded thence to Mount Aetos, situated on the narrow isthmus, hardly one mile wide, which joins northern and southern Ithaca. He found everywhere the purest virgin soil, except on the very crest of the ridge, where, near the chapel of Hagios Georgios, he found a very small plain with an accumulation of artificial soil 10 feet deep. He dug there two long trenches, in one of which he brought to light a terrace-wall 7 feet high, consisting of huge polygonal blocks, well fitted together; to compare this wall to the modern terrace-walls which surround it is to compare a giant's work to a work of dwarfs. Of pottery he found there nothing but a few fragments of black Greek vases. Having here also failed in his researches he most carefully explored Mount Aetos, which rises to the height of 1,200 feet from the sea, and has on its artificially, but rudely, levelled summit a platform of triangular form, with two large cisterns and a small one, and remnants of six or seven small cyclopean buildings, which were either separate houses or—and more probably—chambers of the large cyclopean mansion which is said to have stood there, and is commonly called "the Castle of Ulysses." There can hardly be any doubt that the level summit of Mount Aetos was extended to the north and south-west by a huge cyclopean wall still existing, the space between the top and the wall being filled up with stones and *débris*. Thus the summit forms a quadrangular, even platform 166 feet 8 inches long by 127 feet 4 inches broad, so that there was on the summit ample room for a large mansion and a courtyard. To the north and south of the circuit-wall are towers of cyclopean masonry, from each of which a huge wall of immense boulders runs down. But at a certain distance these two walls begin to form a curve, and ultimately join together. Two more cyclopean walls run down from the top—the one in an easterly, the other in a south-easterly direction, and join the curve formed by the two first-named walls. Lastly, he mentions a huge circuit-wall about 50 feet below the upper circuit-wall. This wall has fallen on the west side, but is in a marvellous state of preservation on the other sides. To increase the strength of the place the foot of the rock has been cut away so as to form a perpendicular rock wall 20 ft. high. In the walls are recognisable three gates. Between all those cyclopean walls once stood a city, which may have contained 2,000 houses, either cut out in the rock or built of cyclopean masonry. Of 190 of these houses Dr. Schliemann has been able to find the ruins more or less well preserved. He measured twelve of them and found them between 21 feet and 63 feet long, and 15 feet to 20 feet broad. The usual size of the rudely cut stones is 5 feet in length, 4 feet 8 inches in breadth, and 2 feet in thickness. The size of these stones by far exceeds that of the stones in the cyclopean houses Dr. Schliemann discovered at Mycenæ and Tiryns. Some of the houses consisted of only one room, others had four or even six chambers. This cyclopean capital is unique in the world, and every admirer of Homer ought to see it.

For two weeks Dr. Schliemann excavated with thirty workmen in those cyclopean buildings; but fragments of pottery, which has no resemblance to any of the Mycenæan pottery, but is much like that from the two most ancient cities at Troy; fragments of most curious tiles with impressed ornaments; also two with a sort of written characters which he has not yet had time to copy; further, the fragments of a most curious handmill—wer the only result of all his labour.

Dr. Schliemann has also commenced excavating the stalactite grotto near the little port of Dexia, which is generally identified with the port of Phorkys, where Ulysses was landed by the Phæacians, the grotto being rightly considered to be identical with the Homeric grotto of the Nymphs, in which Ulysses, assisted by Minerva, hid his treasures. But having opened a trench just before the little altar, down to the rock, without even finding a potsherd, he abandoned this ungrateful excavation. The grotto is very spacious, and it exactly answers the description of Homer, who says, "that it has two entrances, one on its north side for men, and one on its south side for the immortal gods, for no man can enter by the divine door." All this is true, but by the entrance for the gods he means the artificially cut hole in the vault of the grotto, which must have served as a chimney to lead off the smoke of the sacrificial fires. From this chimney to the bottom of the grotto is 56 feet, and, of course, no man can enter by this way. From the vault of the grotto hang innumerable stalactites, which have given to Homer the idea of the stone urns and amphoras, and the stone frames and looms on which the Nymphs weave purple-coloured mantles and veils. Dr. Schliemann most carefully explored the whole southern portion of Ithaca. The town of Vathy, the present capital of Ithaca, is not yet a hundred years old, and the complete absence of ancient potsherds on the flat soil seems to prove that there has been no city or village on the site in antiquity. Before Vathy was founded the city was on a rocky height about one mile further south. On the site of the old town he found but a very small accumulation of *débris*, and no trace of ancient pottery.

Near the south-east extremity of the island, about 4½ miles from Vathy, are a number of stable-like rooms, averaging 25 feet in length and 10 feet in breadth, partly rock cut, partly formed by cyclopean walls of very huge stones, in which Homer must have seen the twelve swine stables built by the divine swine-herd Eumæus. To the east of these stables and just in front of them, thousands

of very common but most ancient potsherds indicate the existence of an ancient rustic habitation, which Homer appears to have described to us as the house and station of Eumæus. This is the more probable as at a very short distance to east of this site, and near the sea, is a white cliff with a perpendicular descent of 100 feet which until now is called Korax—*i.e.*, the Raven Rock, to which Homer refers when he represents Ulysses as challenging Eumæus "to precipitate him from the great rock" if he finds that he is telling lies (Od. xiv. 398). Below the Korax, in a recess, is natural and always plentiful pure water, which the tradition identifies with Homer's fountain of Arethusa, from which Eumæus's swine were watered. Dr. Schliemann excavated as well in the stables as in front of them on the site of the rustic habitation; the stable he found filled with stones, but on the site of the house he struck the rock in a depth of one foot, and found there fragments of very interesting, most ancient, unpainted pottery, also of pottery with red bands, and masses of broken tiles.

Dr. Schliemann states that Ithaca is, like Utica, a Phœnician word, and means "colony," and that the type of the Ithacans is decidedly Phœnician. According to Homer Laertes's grandfather was Poseidon, and Mr. Gladstone is therefore perfectly right that the descent from Poseidon always means "descent from the Phœnicians."

Dr. Schliemann has obtained a new firman for Troy. He left Athens on September 18 for the Troad to continue his long interrupted excavation of Troy. His first work will be to bring to light the whole of the mansion immediately to the north and north-west of the gate, which seems to belong to the ancient city's chief or king.

ARE THE "ELEMENTS" ELEMENTARY?[1]

THE problem set before us by the words which I have chosen as a heading for this article is a vast one; unfortunately the data upon which an answer must be founded are in themselves vague and meagre. It is useless attempting to draw an exact conclusion from inexact data. If the degree of probability which attaches itself to the data is small, the probability of the conclusion being true must be yet smaller.

In the times of the ancients men do not appear to have attached any very definite idea to the word "Element." An element was a something, a material or an imaginary something—it did not very much matter which—a something which one might suppose, if one were so minded, to form a sub-stratum upon which other, apparently more complex, things rested. Fire was an element; it was supposed to enter into the constitution of matter of many kinds. Some people said they believed that fire and water formed earth of different kinds; others averred that air and water were the foundations of all things. But it was perfectly legitimate for a third person to tell the two former that they were completely in error, that *really* sulphur and salt were the primary elements, and that from these all other forms of matter arose.

No exact data concerning the possibility of transforming earth into air, or water into fire, or salt into sulphur were forthcoming. Men did not generally trouble themselves with investigations into the actual properties of the so-called elements. Everything was founded on supposition; the human mind was superior to nature, and could project itself upon nature and explain nature.

Such a method could lead to no true knowledge of natural phenomena. To-day we have altered our method of investigation. Nature presents us with a mass of materials; most of these we can decompose into two or more forms of matter, but some of these resist all efforts hitherto made to effect their analysis. The latter we call elements, the former compounds. Our knowledge is imperfect; we acknowledge the imperfection, but attempt to make the knowledge *exact so far as it goes*. Whether the so-called elements are or are not capable of further subdivision is an open question. Whatever answer this question may finally receive, the superstructure of chemical science will remain unshaken. We may find it necessary to alter the form of many statements; the facts and, I am persuaded, many of the theories, will remain.

An element is then a substance which has hitherto yielded no simpler form of matter than itself. We make the hypothesis that matter is built up or compounded of those substances which we call elements. But this is of course only an hypothesis. So long as we accept it as such it is of the utmost service to us; whenever we erect it into a dogma it ceases to become an aid to the investigation of nature, and begins to exercise a tyranny over us.

An amusing and instructive instance of the narrowing and deadening effect of accepting an hypothesis dogmatically is narrated in Prof. Bryce's recently-published book on Trans-Caucasia. Prof. Bryce accomplished the ascent of Mount Ararat: tradition says that no one has ever been to the summit of this mountain; the inhabitants of the neighbouring country have formed this saying into a dogma which teaches that no one can ascend to the top of Ararat. When Prof. Bryce told the Archimandrite of the district that he had been to the summit the old man only smiled a sweet, sad, pitying smile, and said it was impossible.

The more modern history of the chemical elements warns us against dogmatising concerning the nature of these bodies. Potash and soda were classed among the elements until the year 1807. Water was for ages regarded as elementary; Cavendish first taught us that the long-cherished tradition was false.

The problem of the nature of the elements is one which requires the use of the imagination; it is a problem in endeavouring to solve which we are very ready to give the reins to this faculty, or rather to allow the lower power of fancy to usurp the place of the more divine imagination—and thus we run riot. The naturalist who approaches the investigation presented by the chemical elements had need to learn the scientific use of the imagination.

Many years ago an hypothesis was started by Prout to the effect that the elements are all compounds of hydrogen, that hydrogen is the primary form of matter, and that the molecule of each element is composed of a varying number of atoms of hydrogen. If this hypothesis were correct the combining or atomic weights of the elements would be simple multiples of the combining or atomic weight of hydrogen, *i.e.*, multiples of 1. The experiments of Dumas lent support to the hypothesis of Prout, but the later and more exact researches of Stas negatived the idea.

Stas showed, in a wonderful series of investigations, that the atomic weights of the elements are not simple multiples of 1, nor of $\frac{1}{2}$, as Dumas had supposed, but that they are fractional numbers. Stas further showed that the same number, as representing the atomic weight of a given element, is obtained by different processes of investigation.

But may not Prout's hypothesis have some truth underlying it? Are the elements really elementary? Stas's researches do not answer this question. We may put the general question in two forms. Are the elements compounds, in varying proportions, of a few simple bodies? or, Are the elements compounds, in varying proportions, of *one* primary form of matter? Let us look at these questions in succession—and first we may frame the hypothesis that the elements are compounds of a few simple bodies.

In order to learn what are the general properties exhibited by a series of bodies all of which are compounds,

[1] A paper read before the Owens College Chemical Society.